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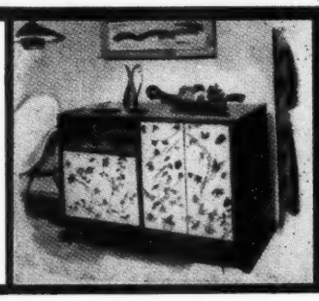

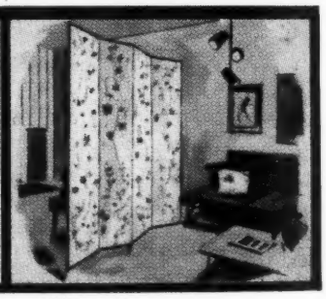

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THIS MONTH'S COVER

Laying up plastic laminate panels with special alignment stacking rack prior to loading into press. Read the final installment in Paul Graham's three-part series on plastic laminates and their use in furniture industry. Article starts on next page.

Furniture
DESIGN AND MANUFACTURING

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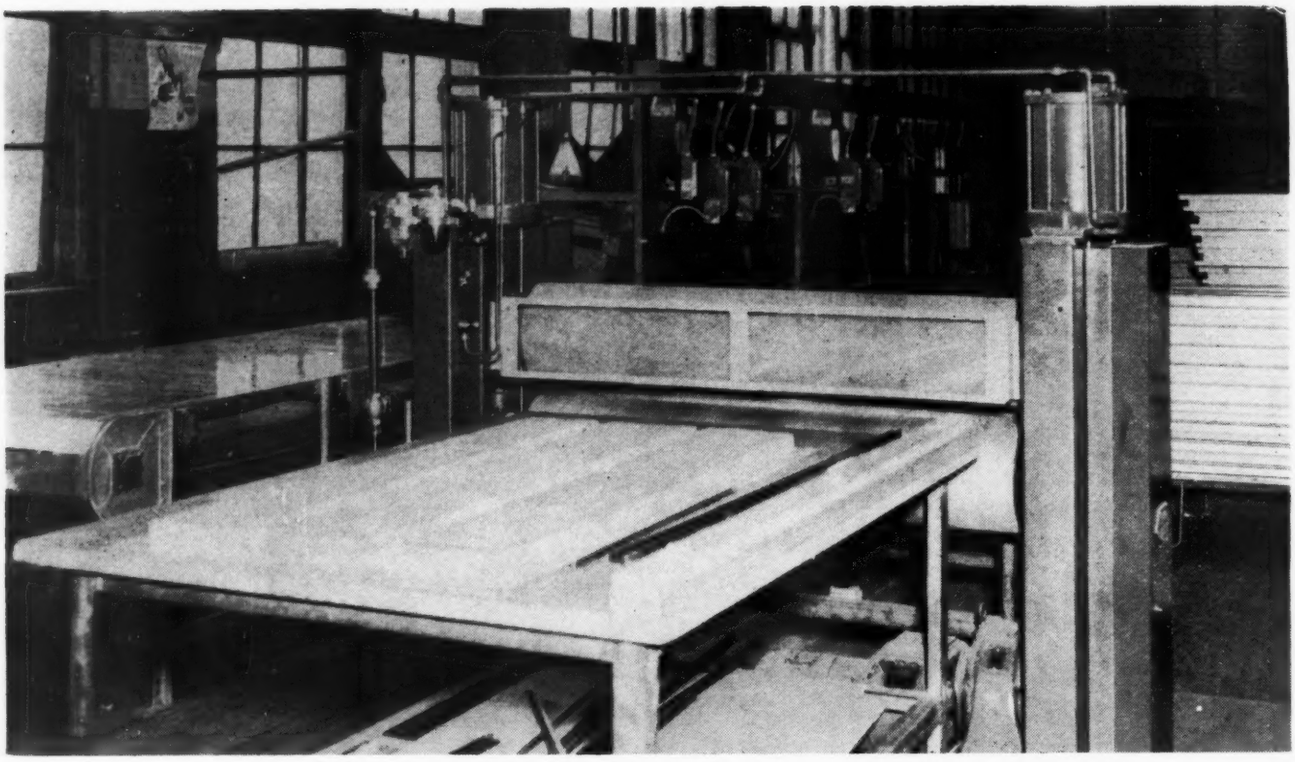

OUTFEED END OF INFRA RED DRYING OVEN. Plastic laminates and core are laid up while still hot from the oven and bonded under pressure of rolls of the rotary press to the right. Pressure is maintained on the rolls by air cylinders.

Decorative Plastic LAMINATES and Their Use in Furniture Field

Comprehensive Report Based on Survey of Materials Available to Industry

By PAUL H. GRAHAM

(PART 3)

The cores are usually cut close to their finished dimension but the decorative and back plastic laminates are usually cut a minimum ⅛-inch oversize to provide a uniform projection along all points of the assembly. This forms a glue trap to catch glue squeeze-out and keeps the glue from running over the laminate faces, through openings between the laminate sheets and the core. After the laminate bond has been permanently set, the panel can be trimmed 1/16-inch all around to remove the glue accumulation.

Cauls used are usually a minimum 2 inches over-size so that no additional time is required for careful placement as well as providing protection against dripping glue.

While laminates are worked from a flat layup, there is less marring or scratching when they are handled on edge in portable bins or trucks. It is customary to load the laminate sheets in a sequence that keeps the backing sheet with its unsanded side and the decorative sheet with its finished side toward the operator, in continuous sequence. This keeps dirt or other abrasive materials from adhering to the faces and allows the sheets to be separated from the pack easily before pulling them loose to lay up on the core.

The glue spreader is most used to apply adhesive although it is also brushed or sprayed on. Some methods require just one facing laminate and/or one surface of the core to be spread with glue and be laid together before the other face is spread. The most common practice is to spread both sides of the core. The primary purpose of the first method is to allow the solvent to evaporate.

In laying up the assembly the backing sheet is usually laid down first, followed by the spread core, and then the decorative laminate sheet. When laying down the sheet, it is well to wipe the underside clean, lay the sheet up on the core, and then wipe the exposed face clean. If more than one panel is to be laid up before pressing, it is customary to insert a thin caul or kraft paper barrier sheet before making the next layup. When breaking up the multi-layer press load, the stack is carefully taken apart and clean cardboard or other adequate protective material is put between the panels as they are stacked face-to-face and back-to-back to protect the faces.

(Continued on page 6)

Straight drill bores easily with a clean edge.

Champfered hole has no burred edges.

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Surface is damage-resistant, provides a superior glue base.

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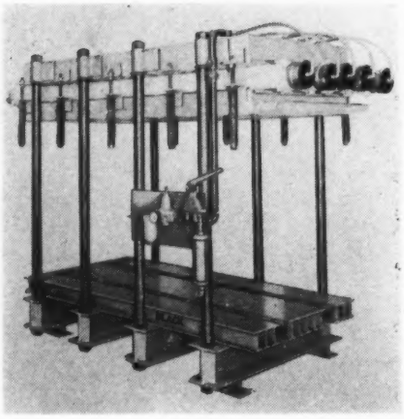
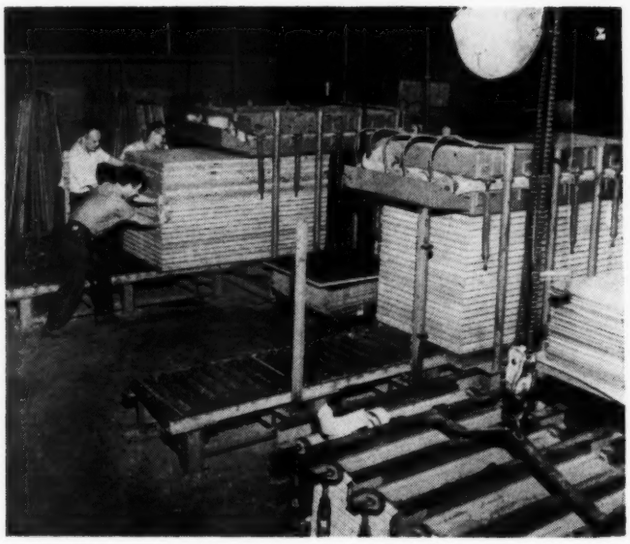


CAGE OR AIR HOSE PRESS used for cold pressing plastic laminate panels operates with air pressure in hose located above the upper movable platen.



LOADING BALE of plastic laminate panel assemblies into air hose press.

Plastic Laminate Bonding Adhesives

When sanded prior to application, plastic laminates have a tendency to warp or curl concavely, thereby creating a dead load, or static stress on the glue line along the longitudinal edges of the laminate. A rigid glue line is generally preferred and adhesives which have good load strength usually produce best results. The final choice of glue depends mainly on durability required in the bond, available equipment for mixing, application and pressing, and operating properties desired.

Adhesives commonly used include: urea-modified or fortified and craze resistant, phenolic, phenol-resorcinol, polyvinyl, and contact bonding adhesives made with natural rubber or synthetic rubber base.

Casein glue will produce an acceptable bond, is low in cost, and has a glue line which provides very little abrasion. This glue performs satisfactorily under low or high temperature operating conditions. It is cold setting and cures at room temperature and is one of the few adhesives which does not pick out the laminate face even after overnight contact. Casein glue has a normal pot life of about 6 hours and requires high glue spread. Curing time is not reduced appreciably by the addition of heat.

The chief objection to the use of casein glue for plastic laminate bonding has been the relatively long clamping time required. An assembly made with casein glue cannot be exposed to water, high humidity, or materials likely to promote mold or fungus growth for long or frequent intervals. Some flexible cements designed for use where the laminate-panel construction is subject to vibration or shock are casein-latex formulations but the bond is not waterproof.

Modified or fortified urea resin adhesives, properly extended and formulated, are popularly used as a plastic laminate bonding agent, due principally to favorable experience with this adhesive in wood gluing operations, available equipment in the plant, good bonding properties and low cost. These adhesives produce a strong, craze-resistant glue line and have good gap-filling characteristics. While they lack extreme water resistance and resistance to high temperatures, they do offer satisfactory properties as far as normal service conditions are required.

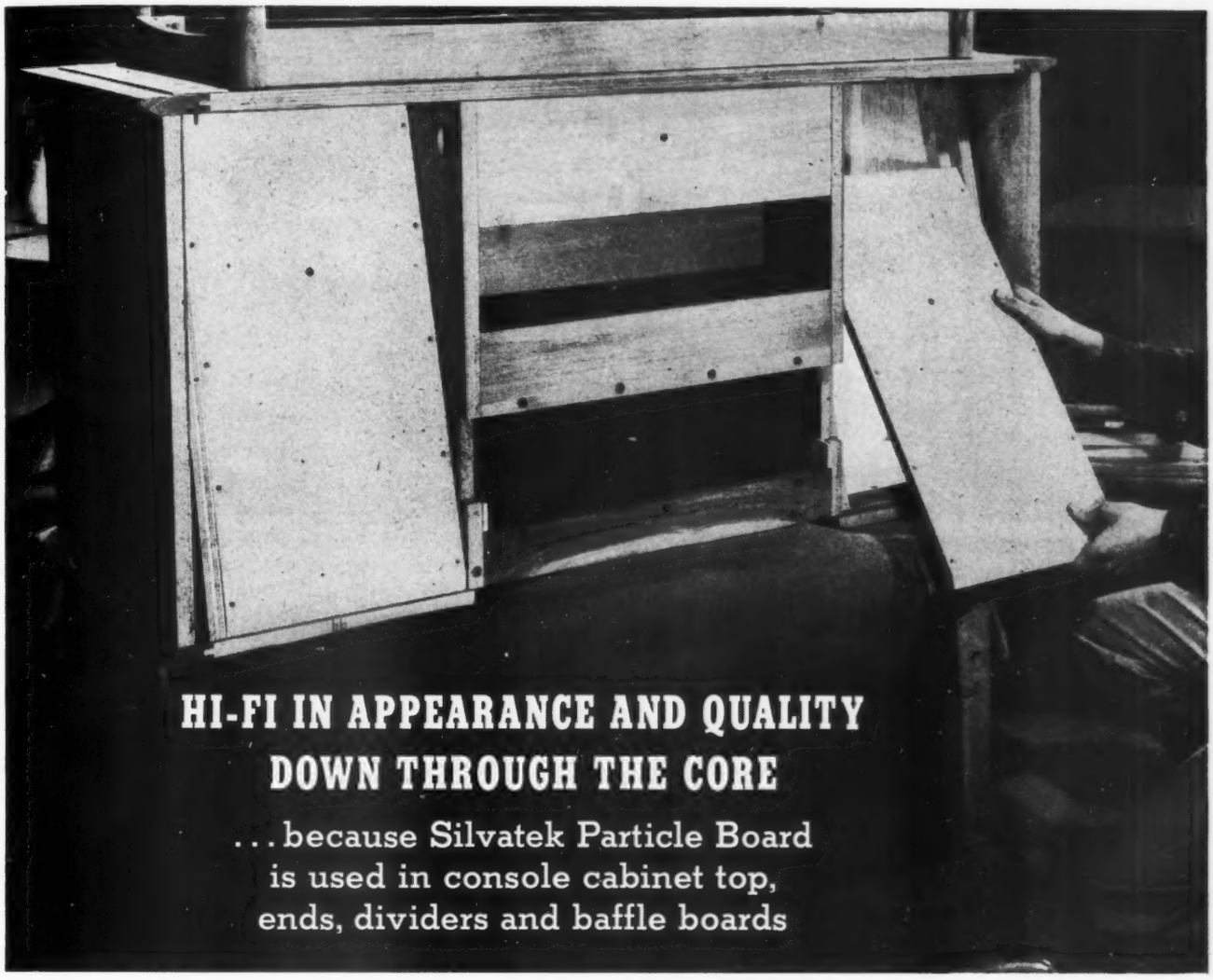
Cold-setting urea glues appear to be favored for table top and similar panel bonding in both cold pressing and hot pressing operations. Various special formulations have also been developed for this particular application. Major faults cited with the use of urea glues are lack of flexibility in temperature operating conditions, limited pot life (2 to 6 hours, depending on catalyst and temperature conditions), tendency to pick out the laminate surface, and toxic effect on operators.

Phenolic, phenol-resorcinol and resorcinol adhesives are used for laminate bonding when requirements of high bond strength, waterproof, resistance to acids and alkalis, and withstanding high temperatures have to be met. These adhesives are more costly than other types. Phenolic resin adhesives may be cured satisfactorily at room temperatures but phenol-resorcinol and resorcinol adhesives must be heat set for efficient operation. Pehnolic adhesives are currently very popular for bonding laminates to hardboard cores with rapid cure schedules.

Polyvinyl glues are being used very extensively for bonding plastic laminates. This is due primarily to the development of a quick clamping method and fast setting glue which permits a bonding cycle of as short as 22 minutes, 10 minutes to layup the panels and 12 minutes under pressure in the press. The bond is satisfactory for normal conditions and while these adhesives generally have poor water resistance, newer polyvinyl glue formulations now incorporate phenolic components which improve heat and water resistance properties.

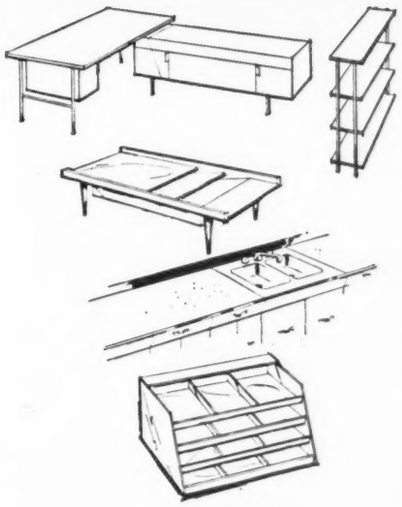
These adhesives set as a result of loss of water which causes the emulsion to break. The bond is somewhat thermoplastic, with a tendency to soften at very high temperatures, but harden again at lower temperatures. Many commercial polyvinyl formulations for this application have immediate tack and have advantages of long pot life, non-toxic, non-abrasive to cutting tools, easy to use, and fast setting. The relatively low cost of the glue and its suitability for use with low-cost pressing equipment are also very attractive.

The use of contact bonding adhesives for plastic laminate bonding is steadily increasing. Formulated with natural rubber or synthetic rubber base, manufacturers of these adhesives claim the bond grows stronger with age by self-vulcanization. Their sheer strength is generally lower than



HI-FI IN APPEARANCE AND QUALITY DOWN THROUGH THE CORE

... because Silvatek Particle Board is used in console cabinet top, ends, dividers and baffle boards



HERE'S QUALITY CONSTRUCTION that begins and ends with Silvatek Particle Board. In the beginning, cut-to-size pieces of the board are laminated with wood veneers to form the top, ends and dividers for this console unit. Above you see the ending as natural Particle Board panels are inserted in the cabinet as baffle boards.

In these and other quality applications, Silvatek Particle Board is proving the best material for the job. Panels arrive ready for 3-ply construction. They are uniform in thickness and density. And each shipment works the same ... sawing, routing, beveling, chamfering, drilling and planing to your specifications. Important, too, are the boards' good dimensional stability and excellent acoustical properties.

Put Silvatek quality in your production picture. Panels are available in densities of 30 to 60 pounds per cubic foot. Specify panels in standard 4 x 8 ft. or cut-to-size dimensions.

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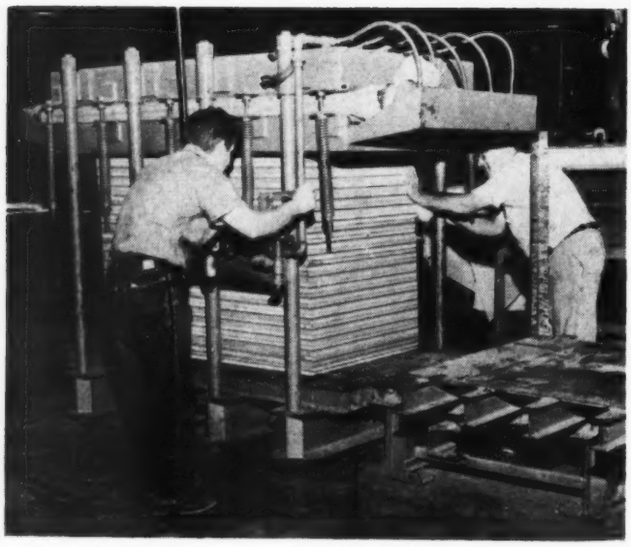
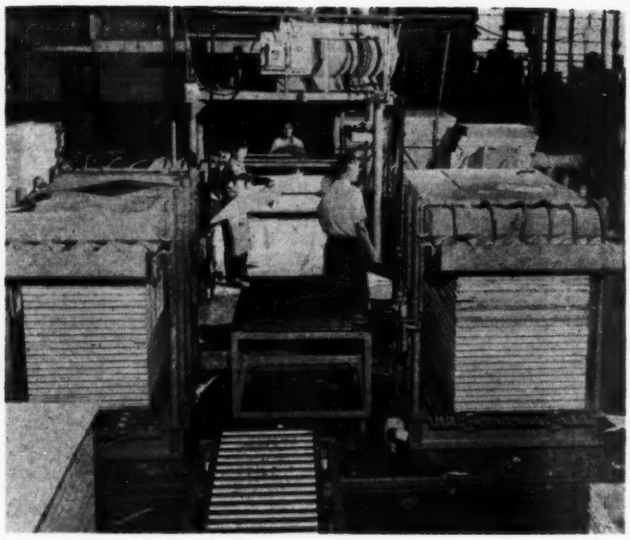


APPLYING PRESSURE for bonding stack by expanding hose. 2-inch stroke delivers 60 p.s.i. pressure over platen with 100 lbs. plant air pressure. Coil springs retract upper platen when hoses have contracted.



LAYOUT OF AIR HOSE presses used for volume bonding of plastic laminated panels for table tops keeps movement and handling to a small area.

other types of adhesives but appears to be adequate for assemblies subject to use under normal conditions.

These contact bonding adhesives develop strength by loss of solvent used to wet the surface and provide suitable application consistency. They are designed to be applied wet and are reported to develop satisfactory bonds where high strengths and resistance to cold flow is not required. They function to mask out grain and have some gap-filling properties.

Some of these adhesives are supplied as two-part formulations comprised of two adhesives which differ in polarity, one an organic solvent adhesive applied as a primer, and the other, a rubber-base adhesive that is applied over the primed surface.

Contact bond adhesives may be roll-spread or sprayed in a double coat, allowing about 2-minute set between coats. The adhesive must dry before bonding mainly to evaporate the flammable solvent. Any solvent left in the glue line will affect the bond. This drying is often accelerated by infra red lamp heating. No matter how long spread-sheets are left exposed, the adhesive is immediately reactivated by wiping the surface with solvent and bringing the components into immediate contact.

These adhesives have high immediate grab strength and once the laminate contacts the core, it is practically impossible to remove it. This requires the laminate to be cut slightly over-size so the core will be completely covered even if the laminate is applied slightly askew. Some use the slip-sheet method in which a heavy sheet of kraft paper is laid over the core. The laminate is laid over the paper and by slipping the paper beneath, the laminate is brought into contact with the core a few inches at a time.

Contact bonding adhesives usually require no mixing but do require perfect bonding contact. Prolonged pressure is not required by drying to exhaust the solvent is mandatory. They are very volatile in nature and their low flash point requires storage and use under proper temperature conditions. These adhesives are thermoplastic and any surface variance in the core can prevent firm, adequate contact. The cost of these contact bonding adhesives is somewhat higher than other types but their processing and other advantages operate to pretty well balance out the over-all cost when application and bonding is considered.

Although any of the adhesives mentioned may be brushed on or otherwise be applied by hand, production methods employ the glue spreader or spraying. Single or double roll glue spreaders are used and desired spreads are obtained with properly grooved rolls and properly set doctor blades or rolls. Spreads will vary with the type of glue and pressing method and are usually governed by the manufacturer's recommendations.

Bonding adhesives are now being sprayed automatically by systems employing an automatic reciprocating spraying machine in a conveyorized spraying booth, a material pump which pumps the adhesive direct from the shipping drum, and various service accessories. The adhesive solutions are not atomized like paint or other finishing materials but are deposited on the surface in relatively small, irregular-shaped spatters, about 1/16-inch in size and close together, in ribbons to cover the surfaces to be bonded. Special spray guns with extra large air channels are used to break up the glue material. Adhesives are also sprayed by hand with similar spraying equipment.

CONTACT BONDING ADHESIVES of rubber-base, solvent type require adequate exhaust facilities to carry away the solvent vapors. The spray booth incorporates its own exhaust equipment but metal hoods connected to an exhaust system, or to a vent pipe, are used over the glue spreader to carry away solvent vapor. They may also be used in a similar manner for other types of adhesives which give off offensive or toxic fumes.

Contact bonding adhesives may be air dried or be dried by banks of infra red lamps in a continuous process oven, equipped with exhaust ducts for solvent vapor evacuation and circulating air to maintain a more uniform drying rate as well as to shorten drying time. The infra red lamps may be arranged along the sides and the spread sheets carried through on edge, or at the top and bottom to dry both sides of the sheets passed between them horizontally. Heat used ranges from 200° to 300 F. and is usually supplied by 375 watt infra red bulbs, although

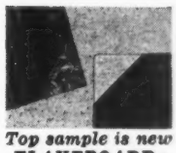
(Continued on page 20)

which sample has the glass core?

We've veneered 1/42-in. mahogany skin to two materials . . . new Pope & Talbot FLAKEBOARD, and mirror-smooth plate glass. We've made critical comparisons of both finished surfaces. And the result? *No detectable differences whatsoever!*

Make your own comparison. Match FLAKEBOARD's exceptional veneering qualities with the standards set by mirror-smooth plate glass! **Free sets of samples shown here are now available. Address your request to Research Director, Pope & Tabot, Inc.**

FLAKEBOARD is genuine wood



Top sample is new FLAKEBOARD; other, plate glass.

. . . yet with no wood grain, no wood defects. It makes fine veneering possible *with no telegraphing;* often eliminates crossbanding. FLAKEBOARD serves many special needs with a significant range of strengths and surfaces. Write us about your requirements.

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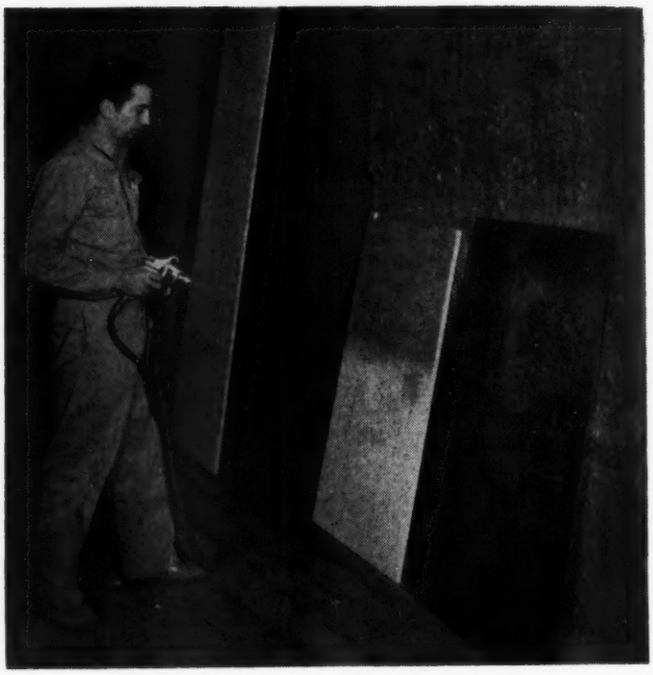
Spraying Glue Speeds Output Of Cabinets

System Breaks Bottleneck in Assembly Line Operations at House of Cabinets Plant



A SMOOTH EVEN LAYER of special consistency glue is sprayed on the adjoining surfaces of the wood base and the plastic top. This is the first step in the production-line manufacturing of plastic counter tops at the House of Cabinets.

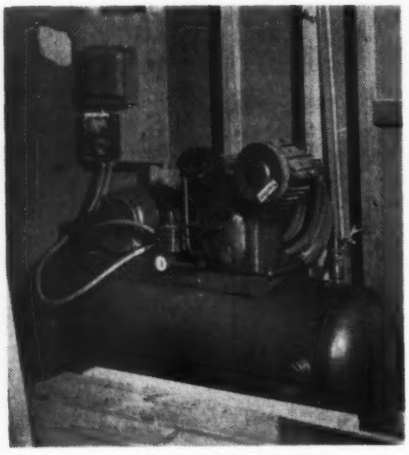
SPRAYING GLUE INSTEAD OF applying it with a scratcher, paint brush or roller has saved time and space while improving product quality at House of Cabinets, Inc., Warren, Michigan.

The system is simplicity itself. Compressed air supplied at 180 pounds per square inch by an air-cooled 7½-horsepower compressor, powers a liquid spray pump. An operator uses a hand spray gun to coat one side of the plywood base and the underside of the laminated plastic covering with a smooth, thin layer of glue. The wood base and the plastic top are immediately put together and run through compression rolls to obtain permanent and uniform adhesion between them.

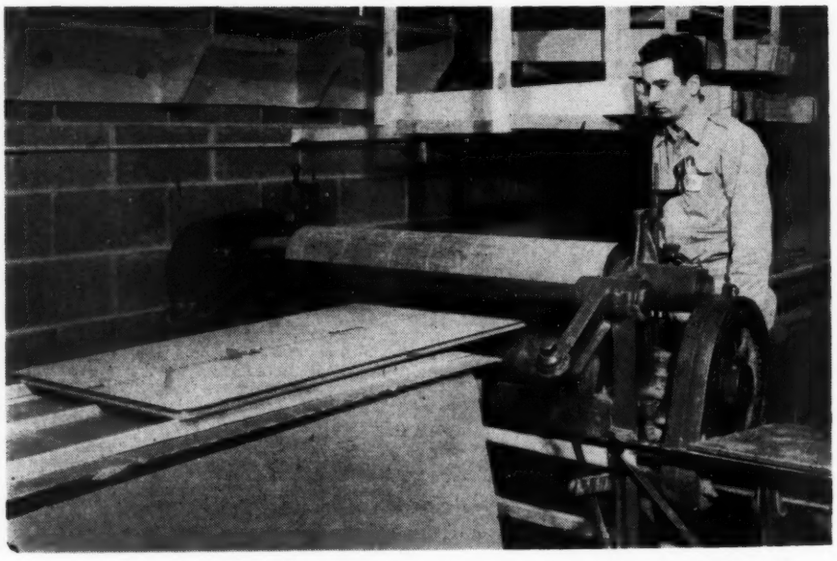
As soon as the part has been run through the compression rolls, trimming, drilling, cutting and edging operations can proceed. There is no waiting for drying time; no storage space necessary to stack the tops; and, equally as important, less scrap.

Previously, glue was applied by hand to both wood and plastic with a scratcher, paint brush or roller. Parts were then put together; clamped in a press; and, stored over night for drying. This method produces a high rate of scrap as there was no way to check the clamping to determine if ma-

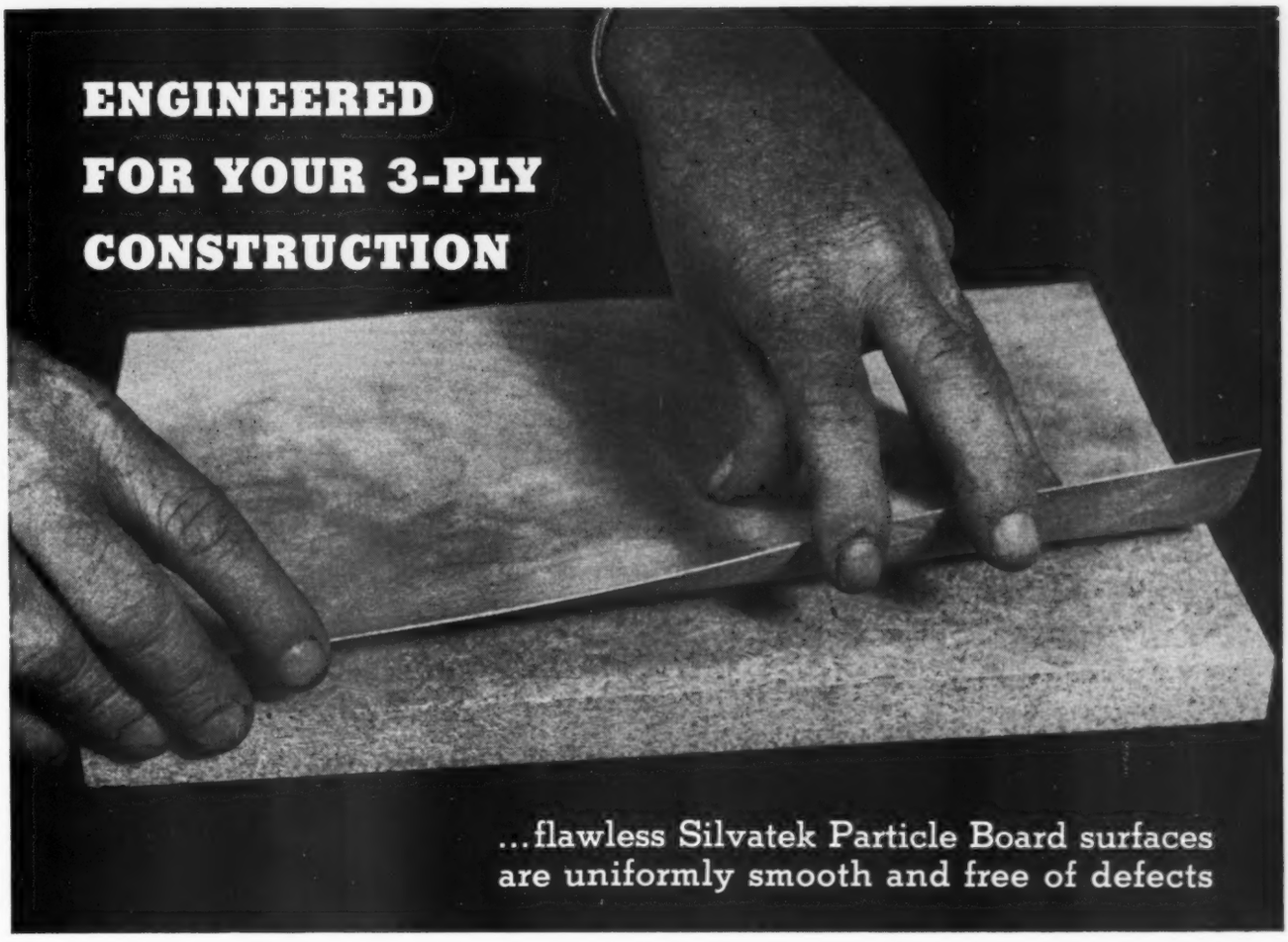
(Continued on page 24)



THIS 7½-HORSEPOWER, air-cooled Ingersoll-Rand compressor supplies 180 psi air to spray the glue. Air staplers on the production line are also powered by the two-stage compressor.



AFTER BEING SPRAYED, wood base and plastic top are placed together and passed through compression rollers. The rolls apply pressure uniformly across the complete surface. The top is then ready to be worked on. There is no storage problem and no scrap due to uneven clamping.



You can laminate fine wood veneers as thin as 1/28" as well as decorative plastic overlays directly to satin-smooth Silvatek Particle Board surfaces. There is no surface grain to raise or telegraph and each panel is uniform throughout in thickness and density. Here's a core material that arrives at your plant *ready* for 3-ply construction. Extra sanding and crossbanding are eliminated.

Silvatek Particle Board provides an excellent glue bond surface for hot or cold-setting synthetic adhesives, contact cements or natural glues. Uniform caliper tolerances ensure maximum contact of particle board core with facing materials... obviating need for extreme pressures in laminating.

You will find these panels machine like wood and have good dimensional stability. Specify Silvatek Particle Board as a core or component for veneered furniture, cabinet doors, plastic-faced counter tops, and displays. Standard size: 4'x8'... lengths to 16', cut-to-size on special order. Densities 30 to 60 lbs. per cu. ft. Thicknesses: 3/8" to 1".

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Feed Rolls Cause Defects In Planing

If Your Operators Follow These Suggestions, Efficiency May Be Improved in Planing Operations

By JOHN E. HYLER

OUTFEED SIDE OF MODERN Greenlee planer in operation at Thomason Plywood Corp., Fayetteville, N. C. By observing top surface of material as it comes from the machine, then turning it over to load it on a truck, the offbearer is able to watch for indentations on the top surface; also for scores on under surfaces. Photograph courtesy Greenlee Bros. & Company, Rockford, Illinois.

DIFFERENT DEFECTS SOMETIMES found on planed surfaces may be traced directly to malfunction of the feed rolls in one way or another. This is not to say they are traceable only to machines in poor condition; that is not the case. One type of defect observed is where a corner of a piece of material is crushed at one point enough to disfigure it, by action of an individual roll section on the top infeed roll.

Sectional rolls were developed, as most operators know, to insure good firm engagement of the roll with different pieces of stock passing through the machine, even though workpieces might vary in thickness somewhat. Since each roll section has independent yield, generally backed up by springloading, a crushing defect may occur on the corner of a preliminarily-sized piece of material, if it is run through the machine slightly diagonal, where the corner of an individual roll section either rides up or drops down. This is especially liable to be serious where soft stock is being planed.

As far as consistent with other factors involved, it is better to plane soft stock before it is finally jointed and sized to width. Nevertheless, the man feeding the planer can often avoid such trouble, if he is careful to register each workpiece properly with individual sections, feeding it straight through the machine. Relieving pressure on the top infeed roll may also be helpful where particularly soft stock is being processed.

Another type of defect which can be very serious is often found where a chunk of wood fouls in the opening between the bed and a planer roll, in such manner that it wedges in tightly, yet part of the chunk is left protruding above the bed line. This, too, is more serious where soft stock is being processed, but will cause trouble with harder material also.

As pieces are carried over the protruding part of the chunk by the feed works, the under side of the material is more or less badly scored. Such chunks can become wedged behind planer rolls without the feeder being aware of it; they may score and badly degrade a large amount of material unless the man at the tail end of the machine watches to avoid it.

To this end, the man tailing a planer does well to turn all material over before piling it on a truck or otherwise disposing of it. This brings the under side of the material into full view as he loads it. Any time he detects such a score running longitudinally on any of the workpieces, the machine should be stopped and the chunk removed from behind he roll.

Pitch On Top Outfeed Roll

Another roll-type defect occasionally encountered is found where coniferous stock, such as pine or fir, is being dressed at least part of the time. Coniferous materials contain multitudinous tiny pitch deposits. Many of these tiny deposits are left exposed after material is freshly dressed. Since it passes onward and under the top outfeed roll almost immediately, this roll tends to pick up a more or less mottled deposit of pitch.

Such pitch as adheres to the top outfeed roll tends to gather dust or dirt. Gradually, the condition builds up to a point where mottled indentations are made in the top surface of material being run. This condition, too, should be watched for by the machine offbearer, and reported to the operator as soon as it becomes serious enough to mark the top surface of any material coming through. The cure for this is to carefully clean

(Continued on page 24)

Ability to handle the UNEXPECTED... acid test of woodworking machinery

...an unusual moulding job at Turney Wood Products, Inc., Harrison, Ark.

This job illustrates a principle which should interest woodworking executives who are good judges of machinery.

Most machines are built to do the *usual job* well. But, when you buy a Mattison Moulder, you get a machine that not only will do the "usual" job faster to higher quality standards, but also will deliver *something extra* for the unexpected job that "pushes" its true rated capacity.

This "No. 228" was purchased by Turney Wood Products, Inc., Harrison, Arkansas, as part of a $120,000 capital expansion program aimed at greater utilization of materials and increased volume. Maximum capacity is 16", and yet the moulder is being used exclusively for shaping deep-formed pew bottoms which are 15⅝" wide, with a 1⅞" double leading edge and beveled back edge. Claude Turney, president of the company, says: "This job requires an extremely heavy cut for the bottom head which shapes the pew seat, and for the inside head as well. The Mattison No. 228 Moulder does an excellent job and *saves us many dollars in sanding operations* over the way we were doing it before."

This section of a 15⅝" wide pew seat taken from a regular stock run on the Mattison No. 228 Moulder at Turney Wood Products, Inc., reveals the smooth surface finish after being shaped by the bottom head.

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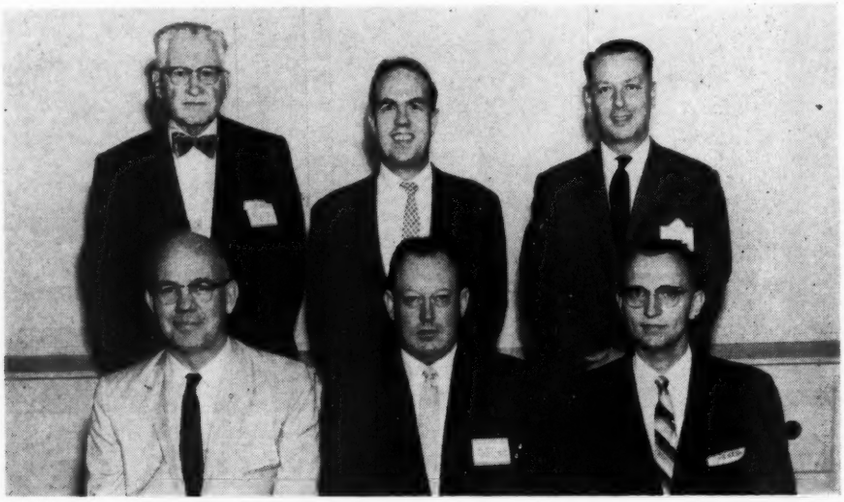
Highlights of NAFM Show and Convention

"Hard-hitting business sessions" and "the best Fair yet" was the consensus of 1,900 furniture and wood-working executives who attended the NAFM Convention and Supply, Equipment & Fabric Fair at Chicago recently. Theme of the 30th annual convention was "How to Roll up Your Sleeves for the Hard Sell Era." Speakers concentrated on ideas and techniques for improving quality and reducing production costs of furniture. The latest developments in furniture manufacture, with particular emphasis on European products and processes, were displayed by 135 suppliers to the furniture industry.

DR. GEORGE HEATON (above), consultant to the furniture industry, told the convention of the "Crusade for the American Home" which will be a central part of the new Home Furnishings Council of America's industry-wide public relations program.

PROFESSOR E. SIGURD JOHNSON (above), head of the furniture management course at North Carolina State College, spoke twice to the convention discussing new ideas in knock-down construction and the latest developments in European furniture manufacture.



NEWLY-ELECTED NAFM OFFICERS gather for a formal picture. Above, top row, left to right: Percy A. Tonk, chairman of the board, Tonk Mfg. Co., Chicago, and NAFM treasurer; John M. Snow, executive vice president, NAFM; Thomas K. Creal, vice president, Fancher Furniture Co., Salamanca, N. Y. and retiring NAFM president. Bottom row, left to right: Tinsley W. Rucker, president, Dixon-Powdermaker Furniture Co., Jacksonville, Fla., and new second vice presidnt, NAFM; Paul Brandt, president, A. Brandt Co., Forth Worh, Texas, and new NAFM president; Harold Sprunger, vice president, Dunbar Furniture Corp. of Indiana, Berne, Ind., and new NAFM first vice president.

A GROUP AT AN INFORMAL RECEPTION held during the NAFM Convention. Above, left to right: John M. Snow, executive vice president, NAFM; James P. Gunter, vice president, David M. Lea Co., Richmond, Va. and president, Southern Furniture Manufacturers Assn.; R. H. McMurtrie, president, Huntingburg Furniture Co., Huntingburg, Ind. and new second vice president, NAFM; Thomas K. Creal, vice president, Fancher Furniture Co., Salamanca, N. Y. and retiring president, NAFM.

OUT-GOING NAFM PRESIDENT Thomas K. Creal (left), vice president, Fancher Furniture Co., Salamanca, N. Y., congratulates Paul Brandt, president, A. Brandt, Co., Fort Worth, Texas, upon his election as new president of NAFM.

TOP ENTRIES of an international design contest in upholstered furniture sponsored by the National Cotton Batting Institute received a great deal of attention at the NAFM Supply, Equipment and Fabric Fair.

BEN J. WILLIS, SR., Willis Furniture Co., Norfolk, Va. (above) and chairman of NRFA's merchandising committee, gave the assembled manufacturers the retailer's point of view as to what manufacturers could do to help sell more furniture.

PRESENT AND FORMER NAFM DIRECTORS and their wives caught at an informal reception during the NAFM convention and trade fair. Above, left to right; Mr. & Mrs. Fred Kuehne III; Mr. & Mrs. D. F. Caldemeyer; Mr. & Mrs. Marcus Levy. Kuehne is vice president, Kuehne Mfg. Co., Mattoon, Ill., and an NAFM director. Coldemeyer is president, National Furniture Mfg. Co., Evansville, Ind., and a former NAFM director; Levy is with Artistic Furniture Co., Cincinnati, and a director of NAFM.

Overcutting Rip Saws and Their Safety Features

Straightline Machines Preferred Because They Eliminate Kickbacks

By JOHN HYLER

VIEW OF MODERN straightedging overcutting ripsaw, at work in the plant of California Furniture Shops, Los Angeles, California. Photograph courtesy Mattison Machine Works, Rockford, Illinois.

THE STRAIGHTLINE OVERcutting type of ripsaw is finding its way into a larger proportion of smaller shops continually, for various reasons. One outstanding factor is the far greater safety it provides for the operator. If one rips material on a handfeed ripsaw, he must be reconciled to the fact that he is doing it in a more dangerous way. Certain types of guards can be applied to the handfeed ripsaw, which aid in preventing kickback. However, none are available for such a machine which are so efficient as the narrow steel kickback fingers incorporated on some of the modern straightedging units, as for instance those made by Mattison.

In cases where material must be ripped at a handfeed ripsaw, it is a very good idea to use a kickback bodyguard, suspended by straps worn over the shoulders, which covers the abdominal and pelvic region. However, it is often difficult to get men to wear these. Experienced men who have ripped much material at the hand-feed ripsaw often form a habit of standing to one side, out of line with the running saw blade. This practice is adopted on the theory that material kicking back is practically always thrown approximately in the plane of the running blade. A man who stands to one side is not liable to be hit so hard, even when a kickback occurs.

Experienced handfeed ripsaw operators learn not to leave any edgings, knots or pieces of offal lie on the saw table close to the running blade. It is mandatory to form this habit, seeing to it that the saw table is fully cleared after each piece of material or board has been ripped. At a handfeed ripsaw, a fence should be used which extends well in the back of the running saw blade, because it will provide much greater protection against kickback. The reason is that it furnishes a suitable guide to keep material traveling in a straight line until it is past and well away from the saw blade.

Special Danger Aspects

Short material is particularly dangerous in regard to kicking back. All such material, as soon as it has been pushed between the ripsaw blade and the fence, should be thrust well past the running blade. Otherwise, vibration may work it around into contact with the rear or ascending teeth of the blade. There, it will be picked up by the blade and thrown with great force.

Men who understand the danger of kickback at a handfeed ripsaw would never think of backing a piece of material up on a running saw blade, but this has been done in many cases by green men, with exeptionally serious results. Also, many inexperienced operators have allowed a piece of material to slip from their fingers and drop on top of a running blade while trying to lift it over, and have been seriously injured as a direct result.

One thing which makes the kickback at a ripsaw especially dangerous is that it is usually directly in line with a man's abdomen. Sometimes it will strike higher, but usually in this area. The particular types of accidents mentioned above are an utter impossibility on a straight edging ripsaw.

Considering the large proportion of serious accidents that have happened at the handfeed ripsaw in days past, it is easy to see why the modern straightline overcutting machine, with its great additional safety, has become very popular. Machines of this kind as made by Mattison are equipped with six pairs of pressure rolls, running in ballbearings.

These rolls are spaced sufficiently close together that stock as short as 7½" can be handled under two rolls, or material as short as 13" under three rolls. The close spacing of these rolls is of great importance in connection with ripping short material. Nevertheless, such units are well adapted for ripping material of any greater length, up to full-length lumber. ■

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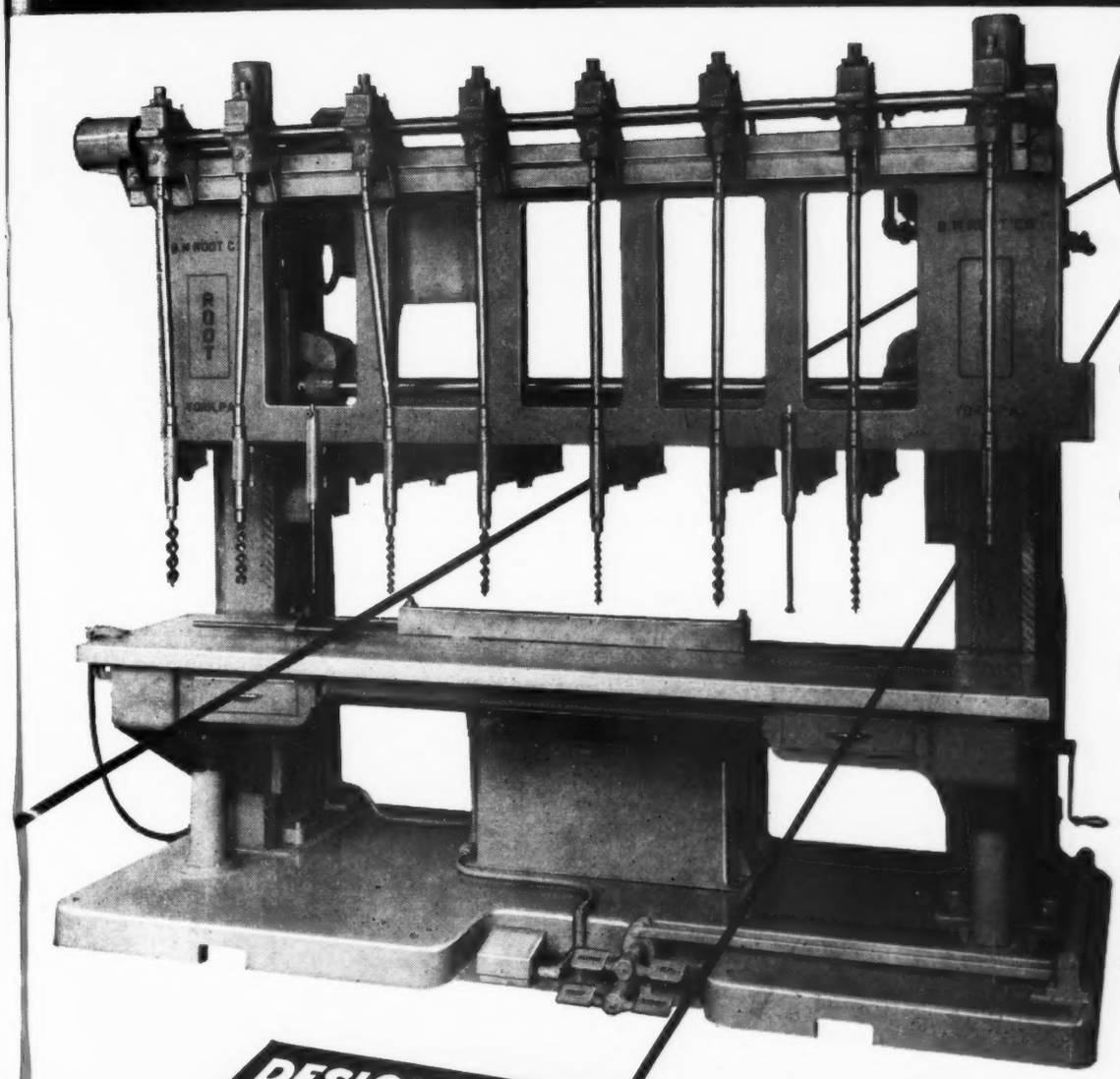

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Tips on Keeping Knives, Cutters In Condition

Ordinary Bench Grinders Can Cost You Money If You Rely On Them For All Your Jobs

By JOHN HYLER

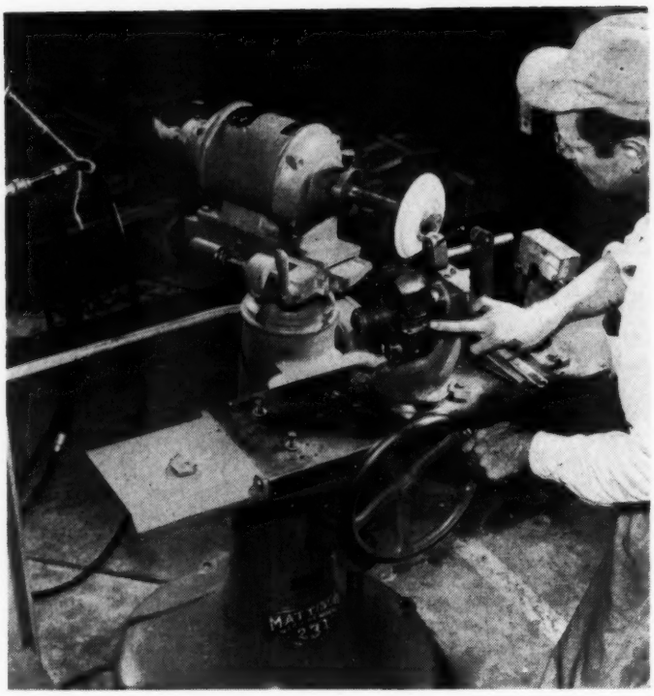

ILLUSTRATION SHOWING MATTISON cutterhead grinder in operation at California Furniture Shops in Los Angeles. In this case, surfacing cutters are being ground in a cutterhead having a short axis. Photograph courtesy Mattison Machine Works, Rockford, Illinois.

A GRADUAL INCREASE IS OBserved through the industry in employment of competent cutterhead grinders and other high-class grinding equipment. There are still many plants, however, which would do well to make a careful examination of such facilities, with a view to bettering their cutter grinding operations. An ordinary bench grinder, where profile cutters can be ground free hand, still has its place in plants where detail cutters must be developed from time to time for short runs. Too many times, however, plant management tries to get along with such a machine for all their cutter grinding. In so doing, they actually lose a great deal of money.

One reason for such loss is that even a reasonably close approach to accurate grinding free hand requires an inordinate amount of time. The other is that regardless of the amount of care used, results obtained in this way cannot possibly compare with those obtained on equipment developed for the purpose. It is a matter of just as great moment to have proper maintenance grinding machines, such as cutterhead grinders, as to have a modern molder, or other suitably-built woodworking machines.

Any operator who tries to maintain that he can do a better grinding job by hand is either deluded himself, or is attempting to deceive others. A really good operator is more liable to be found requesting installation of the best in cutterhead grinding equipment. A good cutterhead grinder is capable of suitable maintenance on both straight surfacing knives and on milled-to-pattern cutters, while they are mounted in the cutterhead. Milled-topattern knives are more expensive at first cost, but are nevertheless far more economical for standard patterns on which continuous or frequent runs must be made.

Profile Uniformity Precisely Maintained

Moreover, where milled-to-pattern knives are employed, and the same cutting bevel is ground on those knives continually, there will be absolutely no variation in the pattern produced. On flat knives that are ground to form, contrariwise, a certain small amount of variation is practically inevitable, from one run to another, unless an inordinate amount of time goes into repetitive knife fitting. Milled-to-pattern knives, when sharpened on a cutterhead grinder, can be ground in a small part of the time that detail knives require. Also, much less skill is required in the grinding process.

Some excellent cutterhead grinders, like those made by Mattison, will handle almost any kind of cutterhead which is 10 inches in diameter or less, and not over 20 inches in length. These units have a ball bearing motor, totally enclosed to exclude all foreign matter from the motor windings and bearings.

This motor, which has an extended and threaded spindle to receive the grinding wheel, is mounted on a swivel head, by means of which it can be set at any desired angle. This makes it suitable for use with either a plain or a flared cup wheel, as desired. Such units are equipped with a handwheel at the front, which the operator uses for moving the table of the machine back and forth. Since the cutterhead being ground is mounted on suitable supports carried on this table, traveling the table is equivalent to traversing the cutterhead.

A second handwheel is provided beneath the table of the machine, which allows raising or lowering it, together with the cutterhead it supports, to any chosen position. The grinding wheel, along with the motor which powers it, has a horizontal adjustment toward or from the cutterhead. Since the grinding wheel can be sensitively adjusted horizontally and the cutterhead vertically, the abrasive wheel and the knives to be ground can be brought to the right positional relationship with absolute exactitude. ■

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Plastic Laminates

(Continued from page 8)

one oven used 1000-watt infra red heaters.

The heating area of this oven was 20 feet long and 4 feet wide and was equipped with 5 panels, each carrying 6 1000-watt 4-foot infra red heaters, to precure the adhesive spread prior to bonding. Each panel was rated at 6 kw and the connected load was 30 kw, 230 volt, 3 phase. An oven of similar dimension used 375 watt infra red lamps spaced on 7-foot centers, about 18 inches from the exposed glue film.

Another had 70 375-watt bulbs arranged in infra red lamp banks connected 5 in series on a 575 volt, 3-phase circuit on 10-inch centers and mounted 8 inches from the work. Speed of conveyors used to carry the work through the oven ranged from 15 to 20 feet per minute and drying times varied from 45 seconds to a minute. Air drying usually took from 15 to 20 minutes at room temperature where these ovens were not used.

Cold Pressing

Lower pressures are usually used for bonding plastic laminates than for plywood and may be as low as 40 to 60 p.s.i. Some of the adhesives used give immediate adhesion without clamp pressure and do not require prolonged clamping. Others may require the laid up bales to be snugged with eye beams and clamp rods.

The conventional screw type and hydraulic cold presses are commonly used and the more recently developed air hose press is quite popular. Assembly time limits of various adhesives are an important consideration in cold pressing, due to the extended layup period required before loading into the press and applying pressure.

The proper pressure is the lowest pressure that will bring the plastic laminates into close intimate contact with the core. Careful and accurate registration of assemblies in the press is very important as well as uniform application of pressure to prevent slippage. Proper press loading requires the same face-to-face system be maintaine, as is used in plywood operations, to prevent marring. Plastic laminates are extremely sensitive to picking up imperfections from caulboards.

Conventional cold press adhesives generally require curing for 4 to 6 hours under restraint of I-beams and retaining clamps. Special adhesives allow speed-up of this slow-curing with the use of catalyst acceleration and/or fast solvent evaporation. Press loads handled in a single cycle vary from 20 to 40 panels per load. A volume producer reported an average 20-panel press load bonded with a 4-hour cure period at room temperature using a cold press fortified urea-formaldehyde glue. Similar reports were received from other plants using casein, polyvinyl, phenolic and phenol-resorcinol adhesives. Contact bonding adhesives were not generally cold pressed as they have special requirements for solvent evaporation and do not usually require prolonged clamping.

The screw-drive cold press used is seldom of the old hand-operated type but rather has power transmitted from the motor to vertical screws to build up pressure, shown by a pressure indicator, to the desired value. The price of an adequate press of this type, 42 x 48-inch platen size and opening to accommodate about 20 panels, is reported to run about $3,000. Additional cost for spring-loaded roller tracks to expedite loading and unloading came to $160 or $180.

Most hydraulic presses of the conventional type have more pressure capacity than is required. A popular press of similar platen size had a 12-inch stroke, a 3-section upper panel, and developed up to 70 p.s.i. pressure over the entire platen area. It was priced at about $4,000.

The air hose press was originally developed for use with polyvinyl adhesives in a quick clamping process but is popularly used with all types of cold press adhesives. It operates entirely with air pressure introduced into several lengths of closely spaced lengths of hose, located above upper movable platen, and the pressing action is produced by expansion of the hose, which can be as much as 4 inches. As the maximum stroke is approached, there is a declining amount of pressure transmitted to the press load.

The normal 2-inch stroke will deliver a pressure over the platen of about 60 p.s.i. with 100 lbs. plant air pressure. Air operates a control valve to bleed air slowly into the hoses so that pressure is applied slowly but positively by the moving platen. Pressure is released by the same control valve, draining air from the hose to contract it. Sturdy steel springs retract the upper platen automatically after the pressing cycle has been completed and the hoses have contracted.

This press has a normal 49-inch vertical opening for the press load and the lower fixed platen is made of closely-spaced I-beams supporting a welded steel plate. Strain rods of the press are designed to take up the tension so that no load is transferred to the floor and no special foundation is required. A retracting roller track is usually used on the bottom platen to expedite press loading and unloading.

The approximate cost of a 42 x 48-inch press unit of this type is reported to be about $1,500 and about $160 additional for the roller track.

Hot Pressing

Hot pressing is probably the fastest method of bonding laminates to cores but this method is not being used as extensively as cold pressing or rotary pressing. The chief objection reported has been the requirement of careful temperature controls. Plastic laminates have a tendency to craze at hot press temperatures and are very sensitive to heat in picking up imperfections. Experience indicates that temperatures for plastic laminate bonding should not go above 180° F. and a safer average temperature is about 160° F.

Moisture in the core and glue line is also more critical in hot pressing plastic laminates, as blistering can be caused by excessive temperatures and formation of steam in the glue line.

Multi-platen hot presses have a greater production capacity and are being used for volume bonding of plastic laminates to cores. The close control requirements of this type of press, however, has caused many plants to adopt presses of the single-opening type that are designed for heating with low-pressure steam, hot water or hot oil. Some of these presses have been designed for continuous operation, with dual reciprocating loading and unloading tables. The curing cycle under pressure is seldom more than 2 minutes, or just about time enough to load the second table.

A plant which uses an intermediate layup table in place of the reciprocating tables, between the glue spreader and a 50-ton single-opening hot press of this type reports bonding pressure applied for curing at about 10 lbs. steam pressure. Heat is automatically controlled at about 160° F. and controls are preset to provide automatic press opening after a bonding cycle of about 2 minutes. The plastic laminates are applied over a hardwood lumber core and a catalyzed and extended urea-formaldehyde adhesive is used.

Aluminum cauls are used in hot pressing plastic laminates but better results are reported with stainless steel cauls used to protect the laminates. These cauls are relatively easy to clean and appear to have a longer

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working life than aluminum cauls. Aluminum cauls seem to be more prone to pitting. A favored caul is approximately $\frac{1}{8}$ inch thick and the upper caul is of ground and polished stainless steel to obtain a mirror-like gloss finish.

The single opening press heats the platens uniformly with steam or hot oil and permits the use of low steam pressure, from 5 to 15 lbs., for plastic laminate bonding. The platens have steam chests about 4 inches high, with baffles welded on their faces for uniform distribution of heat. Wet steam gives effective temperatures as the depth of the chest practically eliminates waterlogging.

While maximum pressure is in a range of 140 p.s.i., desired pressure is quickly adjusted and accurately controlled by a pressure setting device. Platen temperature is similarly controlled. As used for plastic bonding, the press is reported to operate with a 2 or 3-minute bonding cycle to produce an average 15 to 17 panels per hour. An automatic timer opens the press for unloading and reloading, with loading performed alternately from side to side. The cost of the press is reported to be about $12,000, equipped for steam heating, or about $16,000, equipped with electric immersion heater in hot oil for hot oil heating.

A vacuum press, more popularly used for post forming plastic laminates, is also used for hot pressing flat panels. This press uses a flexible, hot platen, operating at about 180° F. to set the glue bond, and provides smooth pressure by the vacuum method, with most of the air under the flexible platen removed. Atmospheric pressure on the outside sets up at a rate of about 12 p.s.i. or over 40 tons over the outside area of the platen.

The assembly is placed right side up in the press and the flexible platen is closed. Vacuum created by a vacuum pump takes hold and stays fixed at that point until an automatic timer releases the vacuum at the end of a 6 to 8 minute cycle, when the press opens up automatically for unloading and loading. Operation cost is relatively low since the heating element requires only 6400 watts when it is in operation and it operates only about one minute out of five during a normal operating period. The cost varies with electrical rates in the area of operation but averages about 10 to 15 cents per day. The cost of the press is reported to be in a range of $2,500 to $3,000, depending upon individual job requirements.

Rotary Pressing

Nip roll or pinch roll pressure provided by a rotary type press, operating in a manner similar to the conventional double roll glue spreader, is used to bond laminates to core when contact bonding adhesives are used. Some other adhesives with high grab properties are also pressed in a similar manner. Pressure to bring the plastic laminate faces into intimate contact with core surfaces is supplied by pressure rolls. Pressure is maintained on the rolls by heavy coil springs or air cylinders. A minimum 100 p.s.i. roll pressure is usually required.

One plant converted an old double roll glue spreader for this purpose, with new rubber-covered rolls and pneumatic pressure mechanism added, at an overall cost estimated at about $700. The rolls revolve very slowly to apply pressure. The rotary press is used in a continuous production system to bond table tops with plastic laminates at an average cycle of about 3 minutes per top.

Contact bonding adhesive is applied in two stages to one laminate face and one core surface. The spread units are passed through a continuous infra red drying oven through banks of 70 infra lamps which produce 200° F. drying temperature to set the adhesive into tack in 45 seconds. The precured components are laid up directly from the conveyor of the oven, so the glue is still hot in contact, and the assembly is squeezed through rolls of the rotary press into intimate contact. The bond set up to permit handling, with assemblies piled in solid stacks in 15 to 20 minutes at normal room temperature.

A typical commercial rotary press consists of a set of equal diameter power-driven rolls between which the laminate-core assembly is pass under pressure. It has 44-inch rubber rolls sufficiently hard to insure positive lamination without marring or scratching of 8¾ inch diameter. The upper roll is adjustable to 4½ inches vertically from the lower roll. It is supplied with or without variable speed.

Standard speed is about 30 feet per minute, variable speed from 10 to 60 feet per minute. Reported costs were about $1,400 for a rotary press of this size with single speed and pressure springs, or about $1,700 with variable speed. The same press using air cylinders in place of the pressure springs costs about $1,800 with single speed, or about $2,200 with variable speed.

Roll pressure is used without heat for bonding contact bonding adhesives but it is customary to pile the bonded panels in solid stacks or clamp them into bundles until a complete cure has been effected. Full cure usually

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requires about 12 hours at room temperature but the panels may be handled in 20 to 45 minutes, if required. Where thermosetting adhesives are used, some plants have used the rotary pressing method with steam or hot-water heated rolls. Roll temperatures are extremely critical in this application and must be watched and controlled very carefully to prevent crazing and blistering.

Cores

Regardless of the high quality of the decorative plastic laminate, suitability of the bonding adhesive, and efficiency of the bonding process, the quality of the finished laminated panel is still governed considerably by the type and quality of the core. Cores commonly used for laminated furniture panels include: plywood, solid wood, hardboard, particle board and flakeboard cores.

All veneer plywood has good strength and dimensional stability and is generally considered the best material for use with plastic laminates. It is most costly in the thicknesses required as plywood must be of ½ inch minimum thickness to provide the desired stability. Face and back veneers should also have a minimum ⅛ inch thickness after sanding to prevent telegraphing and show-through of any defects. Although well patched plywood may be used, no openings should be allowed in the face of more than 1/32-inch and best results are obtained where there are no voids.

Most furniture manufacturers prefer to use ¾ inch plywood for cores unless the laminated panels are to be used for pieces with large surface areas, such as dining or library tables, for which heavier plywood is better suited. A low-cost plywood that is currently very popular is made with a fir veneer core or similar coniferous laminations, faced with smooth hardwood face veneers.

Close grained species, such as birch, gum, lauan, poplar and maple. Mahogany faced plywood is preferred for cores of high quality plastic laminated panels. Philippine mahogany has proved to be a good face veneer, with its uniform texture and little or no grain rise.

Solid wood cores have given trouble unless they were faced with crossbanding and face veneer. One of the major requirements of this type of core is a uniform moisture content of components. Any appreciable differences in moisture content can cause expansion and contraction sufficient to shift the plastic laminate overlay after bonding. An acceptable moisture content range is usually from 5 to 12%, with allowable differences depending upon limits of the bonding adhesive used. Some are more compatible to moisture than others. Best results are also obtained when solid wood cores are worked under equilibrium moisture content conditions of about 7%.

According to successful commercial producers of plastic laminated panels, the ideal solid wood core for use with plastic laminates is made with the same or similar wood species and density, of straight grained stock that is free from defects, voids or torn fibers, and of a uniform moisture content within acceptable adhesive limits. It is smooth surfaced and covered by close grained hardwood veneer crossbanding and face veneers permanently fused to the solid wood core.

Where hardboard is used as a core material for plastic laminates, tempered hardboard is usually selected for its superior stability. Both faces are sanded before the plastic laminates are applied and the panel assemblies are permanently bonded by hot pressing. Hardboard is not as subject to the problems of show-through, telegraphing and surface defects com-

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mon to other core materials.

Although some manufacturers do apply plastic laminates directly to particle board or flakeboard surfaces, end results are not always satisfactory. Better results are obtained when these surfaces are crossbanded and faced with smooth, close grained hardwood veneer. When these boards are faced in this manner the material is easier to handle in the gluing operation. Any small particles of foreign matter will, in the pressing operation, be forced down into the softer veneer. They do not show up as pimples in the face of the finished panel, which often occurs when laminates are applied directly to particle board or flakeboard surfaces. These board materials have a decided tendency to telegraph or reflect any surface irregularity to the finished laminate surface if their surfaces are not covered.

The physical characteristics of plastic laminates are such that they do not withstand high pressures or high temperatures very well. It is important, regardless of the type of core used, to hold pressures and temperatures to a safe level so that any imperfections in the core will not be telegraphed through to the plastic top surface. One of the drawbacks to make the plywood or other type of core and apply the plastic laminate in a single operation has been the inability of the plastic laminate material to withstand the high pressures and temperatures normally required to produce the core. ■

Spraying Glue

(Continued from page 10)

terial was cocked. Glue coverage could also be uneven—resulting in unglued patches subject to failure during processing or service.

Leon Blachura, president, said, "The processing of laminated exteriors for kitchen cabinets, bathroom vanities, play room bar tops, and custom work continually proved to be our production bottleneck. We build cabinets on an assembly line—bringing the material in at one end of the building and processing all parts along a gravity roller-conveyor that runs the complete length of the building."

In an effort to clear this obstacle to complete production line operation, House of Cabinets purchased the Type-30 Ingersoll-Rand compressor and began experimenting with various glue consistencies, coverage rates and rolling pressures. A research project such as this is a considerable undertaking for a custom cabinet manufacturer with only 75 employees. However, the research paid handsome dividends. All laminated-plastic cabinet exteriors are processed on their own conveyor that feeds the completed tops directly to the main system for final assembly.

Two vital steps that cut cabinet top processing time in half while reducing the amount of scrap are: (1) the application of a smooth, even coat of special consistency glue to both the wood base and the plastic overlay; and (2) adhering the parts by running through compression rolls. Since storage is eliminated with this process, 7 or 8 tops never have to be unstacked to get the pattern needed. The right top is always available for processing and integration into the production line. ■

Feed Rolls

(Continued from page 12)

the top outfeed roll as often as may be necessary, to keep such deposits removed. This should be done with the machine at rest.

A good method is to use kerosene and a sharp-edged hardwood paddle to clean and scrape the deposits free, then wipe the roll with a rag or a paper napkin. With the machine at rest, only thirty or forty degrees of the roll surface can be cleaned this way at one time. The machine must then be turned over by hand far enough to expose another like portion of the roll to the cleaning process. This should be repeated until the full length and circumference of the roll is clean again.

Uniform Roll Action

It is of course true that on outdated planers, which do not have smooth, uniform roll action, any nonuniformities will be transmitted to the machine feed. A wavering feed will result, with choppy work. Most of the modern planers, as for instance those made by Greenlee, have practically all rolls gear driven, using carefully machined gears in perfect mesh, to insure uniform feeding action. Double expansion links are employed, to keep the roll gears in complete mesh at all positions of the bed. ■

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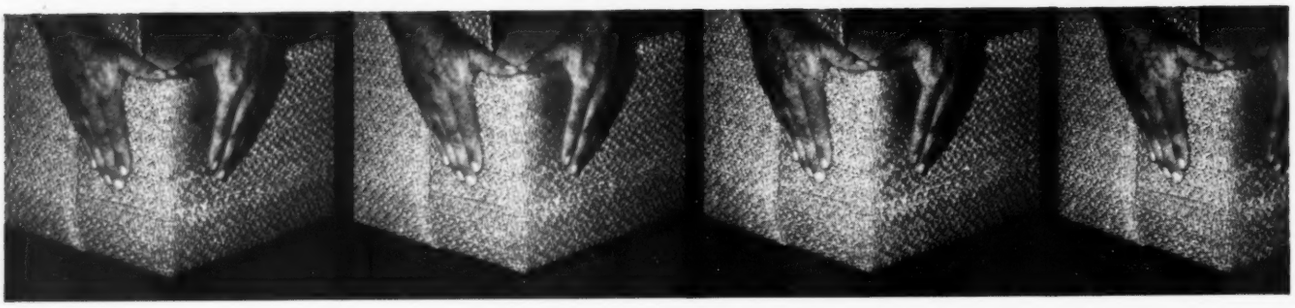

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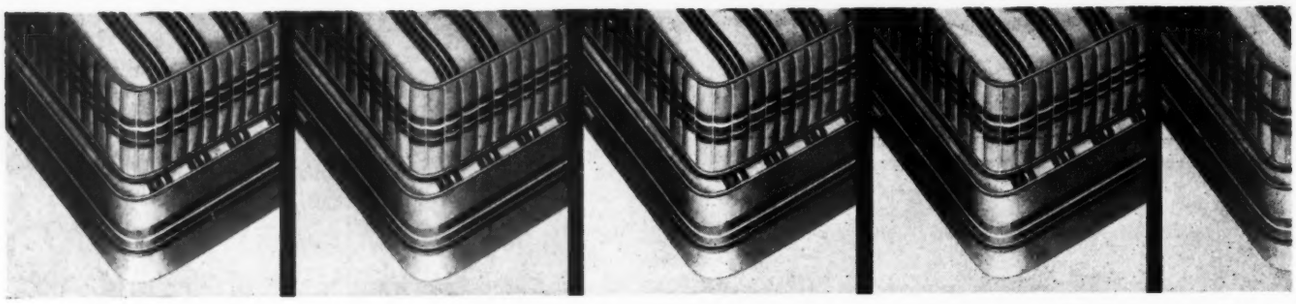

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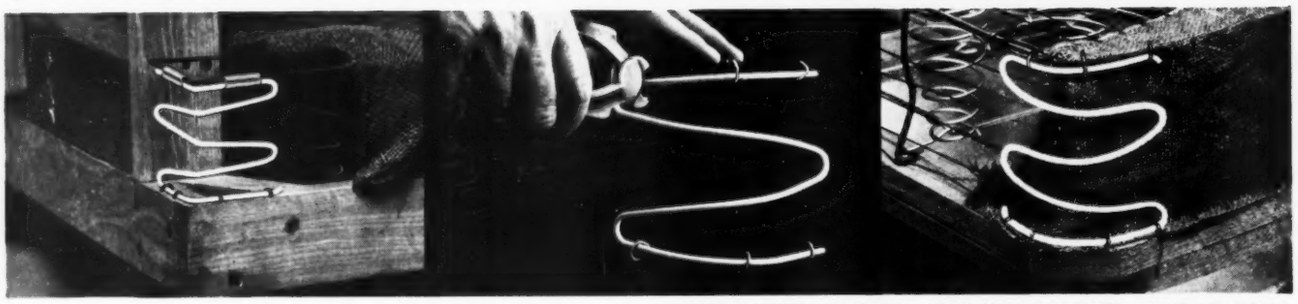

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